Microbial Risk Assessment (MRA) As a Method of Assessment for Drinking Water Refll in Pattinggaloang District of Makassar City

Alfina Baharuddin[1], Muhammad Ichsan[2]

[1]Postgraduated of Environmental Health University Moslem of Indonesia,
[2]Lecturer in Departement of Environmental Health University Moslem of Indonesia

Abstract

Refill drinking water is one of the answers to meeting the needs of Indonesian drinking water that is cheap and practical. This is the reason why people choose AMIU to be consumed. The purpose of this study is to determine the risk of microbial drinking water in the community consumed in the working area of Pattingaloang Public Health Center in Makassar in 2019

This type of research is descriptive with Microbial Risk Assessment (MRA) assessment on refill drinking water. The sampling technique was done by a total of 6 depot drinking water refill sampling. Data processing is done by the SPPS method, the data presentation is carried out using tables accompanied by narration.

Laboratory results carried out on 6 samples of refill drinking water obtained were as many as 6 samples which were stated to be Positive (+) containing bacteria. *Coli* Based on a Quantitative Risk Assessment, it was concluded that from 6 DAMIU samples had a high risk concentration, for the estimated number of bacteriaE. Coli in Refill Drinking Water in the surrounding area of the Pattingaloang Health Center in Makassar City.

It is recommended for consumers to refill drinking water in cooking first, because pollution / contamination can occur starting from the process of taking raw water, processing and packaging / filling in gallons**.**

Keywords: *Drink water, MRA, E.coli, Microbial risk*

Introduction

WHO (2015) found that 663 million people still had difficulty accessing clean water In connection with this water crisis, it is predicted that in 2025 nearly two-thirds of the world's population will live in areas that experience water shortages [1]. The forecast was reported by the World Water Assessment Program (WWAP), formed by the United Nations Educational, Scientific, and Cultural Organization Regarding Indonesia, in 2012 the Indonesian Institute of Sciences (LIPI) recorded that Indonesia was ranked the worst in the service of the availability of clean water and suitable for consumption in Southeast Asia [2,3].

Corresponding author:
Alfina Baharuddin
alfina.baharuddin@umi.ac.id

One of the studies in Microbiology is the material for growing and growing microorganisms from the environment, including microorganisms that have an environment, one of which is in food[4]. Food is one of the basic needs for human life. Food functions to maintain the body's process of growth or development and replace damaged body tissues, obtain energy to carry out daily activities, regulate metabolism and various water, mineral and other body fluids, also plays a role in the body's defense mechanism against various disease[5].

According to WHO Risk assessment is a structured process for 'determining risks associated with all types of hazards - biological, chemical or physical in food. It has the aim of characterizing the nature and possible dangers resulting from human exposure to agents in food[6]. Risk characterization usually contains qualitative and quantitative information and is associated with a certain degree of scientific uncertainty[7].

Microbial Risk Assessment (MRA) is a methodology used to organize and analyze scientific information to estimate the probability and severity of an adverse event[8]. Set on microbial food safety, this methodology can also help identify the stages in the manufacture, distribution, handling, and consumption of food that contribute to the increased risk of foodborne illness, and help focus resources and efforts to most effectively reduce the risk of foodborne pathogen[9].

Based on the Unicef Joint Monitorong report, the performance of the water and sanitation sector in Indonesia is still considered low compared to other countries in Southeast Asia[10]. Of Indonesia's population of around 218 million people in 2015, an estimated 103 million people (47%) did not have access to sanitation and around 47 million people (22%) did not have access to clean water. Only around 50% of the entire population of Indonesia has access to drinking water[11]. Meeting the current needs of community drinking water varies greatly. Population needs for drinking water can be met through water served by piping systems (PAM), bottled drinking water (AMDK), and refill drinking water (AMIU). The tendency of the population to consume ready to use drinking water is very large so that the effort to replenish drinking water is growing very rapidly[12].

Makassar City Health Office shows the distribution of diarrhea cases according to Makassar city health centers in 2017 there were 46 health centers. The highest case of diarrhea according to the Makassar City Health Center in 2017 was the Pattingaloang Health Center with a diarrhea case of 933 cases. In the Pattingaloang Puskemas working area there are 6 refill drinking water depots[3].

This is because careless disposal of human and animal feces will cause pathogens in the feces to transmit through the soil media and spread in water sources which are then used by humans. As a result, almost every year sanitation and contaminated drinking water contribute to 88% of child deaths due to diarrhea throughout the world[13]. Based on this, the high incidence of diarrhea in infants in Indonesia can indicate poor sanitation and drinking water sources that are used by the community[14].

Material and Method

This type of research is descriptive with Microbial Risk Assessment (MRA) assessment on refill drinking water, the sampling technique is carried out in total total sampling of 6 refill drinking water depots. Collecting data using observation sheets, and using a questionnaire then carried out examination of drinking water samples in an integrated laboratory to FKM UMI. Data processing is done by the SPPS method, the data presentation is carried out using tables accompanied by narration. Inspection of Samples for drinking water that has been taken is done by checking the presence of E bacteria. coli in it. Tests are carried out three times each for the same sample of 6 samples.

Materials and Tools

The tools used in laboratory tests are: Incubator. Autoclaves., Weighing tools, Pipettes, Warp tubes, Tubes of dhamham, Cotton, Wire loops (ose) made of chromium-platinum, Burning bunsen Test tube racks. The materials used: Aquades, Lactose Broth (LB), Briliant Green Lactosa Broth (BGLB) 2%, Label paper, Aluminum foil, Drinking water samples.

Result

Based on table 1 shows the number of E. coli in the AMIU depot in the Pattinggaloan Puskesmas.

Table 1 : Identification bacteri in Pattinggaloang District of Makassar City

code Sample	Cultur Bacteri	Result	Ket
DP 1	Positif (+)	9	Not Eligible
DP2	Positif (+)	23	Not Eligible
DP 3	Positif (+)	>1400	Not Eligible
DP 4	Positif (+)	28	Not Eligible
DP 5	Positif (+)	7	Not Eligible
DP 6	Positif (+)	7	Not Eligible

Based on table 1 shows that of the 6 samples tested in the laboratory were positive (+) containing E. coli bacteria, refill drinking water that contained the highest bacteria in refill drinking water with DP3 code with the number of bacteria> 1400 E. coli bacteria.

Table 2: Physical Quality Water refill drinking water depots in the working area of the Pattingaloang Community Health Center in Makassar City

code Sampel	Suhu		pH		Turbidity	
	°C	Information	pH	Information	NTU	Information
Depot 1	25	Eligible	6,03	Not Eligible	0,00	Eligible
Depot 2	25	Eligible	5,65	Not Eligible	0,00	Eligible
Depot 3	25	Eligible	5,43	Not Eligible	0,00	Eligible
Depot 4	25	Eligible	5,8	Not Eligible	0,00	Eligible
Depot 5	25	Eligible	5,86	Not Eligible	0,00	Eligible
Depot 6	25	Eligible	5,88	Not Eligible	0,00	Eligible

Based on table 2 shows that the frequency of distribution of respondents based on the physical quality of refill drinking water depot that meets the requirements with 6 samples Smelling parameters, turbidity parameters meet the requirements of 6 samples, temperature parameters meet the requirements of 6 samples, while those that do not meet the requirements namely parameters pH with a total of 6 samples on the physical quality of water.

Table 3: Estimation of Community Microbial Risk Assessments Consuming Refill drinking water in the working area of the Pattingaloang Health Center in Makassar City

code sample	Cr (AMIU quality)	Cd (Konsentration bacteri)	(d) Dosis	Pinf.d (Infeksi/ day)	Pinf.y (Infeksi/ yaers)	Pill	categori
DP1	9	42.084	0.0042	9.6721E-06	4.1803E-03	1.636E-05	High risk
DP2	23	103.776	0.0103	5.2340E-05	1.9104E-05	3.653E-05	High risk
DP3	1400	7116.2	0.0007116	3.6163E-06	1.3199E-03	3.261E-05	High risk
DP4	28	154.7	0.0154	7.8523E-05	2.8562E-03	7.614E-05	High risk
DP5	7	31.535	0.0031	1.5753E-08	5.7501E-05	2.739E-05	High risk
DP6	7	31.535	0.0031	1.5753E-08	5.7501E-05	2.739E-05	High risk

Sumber : Data primer

Based on table 3 that the concentration of bacteria in Refill Drinking Water in the area around the Pattingaloang Health Center in Makassar City with 6 samples stated to have a high risk of disease.

Discussion

Microbial risk assessment is a process for calculating or predicting risk in a target organism, system or subpopulation, including identification of certainty that accompanies it, after being exposed by certain microorganisms by taking into account the inherent

characteristics of the cause (microbes) that are being studied and the specific target system characteristics[15].

Microbial risk assessment can be done in two ways based on data and the methods used both qualitatively and quantitatively. Risk assessment consists of four stages of study. The four stages are hazard identification, dose-response analysis (quantitative methods) and hazard characteristics (qualitative methods), exposure analysis and risk characteristics[16].

Based on table 3 it can be seen that the concentration for high risk levels, the concentration of germs that is for sample code DP1 colony / gr with a value of Pinf.d = .6 9.67 x 10-06 and Pill = ≥ 1.63 x 10-05, Code sample DP2 23 colonies / gr with Pinf.d value = ≥ 5.23 x 10-05 and Pill = 65 3.65 x 10-05, Code sample DP3 1400 colonies / gr with Pinf.d value = ≥ 3.61 x 10-06 and Pill = ≥ 3.26 x 10- 05, DP4 sample code 28 colonies / gr with Pinf.d value = 85 7.85 x 10-05 and Pill = 61 7.61 x 10-05, Sample code DP5 7 colonies / gr with Pinf.d value = ≥ 1.57 x 10-05 and Pill = ≥ 2.73 x 10-05, Column DP6 sample code / gr with Pinf.d value = ≥ 1.57 x 10-05 and Pill = ≥ 2.73 x 10-05 ,

From the results of a quantitative microbial risk assessment, it can be seen that E. Coli bacteria are very pathogenic to humans. Even with the concentration of safe risk being consumed continuously for a long time, it has provided a high risk for people who consume AMIU from some of the depots[4].

The results showed that there 3 depots whose water samples did not meet the requirements in terms of the MPN Coliform parameter because the coliform content exceeds 0 in 100ml sample samples water. Whereas for inspection based on Escherichia coli parameters, all samples were fulfilled requirements because the content of Escherichia coli in the water sample is 0 in 100ml sample sample water[5].

Identification of Escherichia Coli conventionally using biochemical reactions test and inoculation, it requiring quite a long time, the biochemical tests is hard to do, and are not accurate. This is because the bacterial colony alleged *Escherichia coli* in selective media and deferential media is often not pure and mixed with other *Enterobacteriaceae* bacteria [17].

According journal i)n makassar All depots that were sampled in Mariso Subdistrict did not handle the containers carried by the buyer in accordance with the regulation. The most common method used by most depots now is to brush and rinse with product water afterwards, then fill it immediately.In Mariso sub-district, 38.46% of the samples were brushing and rinsing and 60% of them produced drinking water with quality according to the regulations while the rest showed positive results. While the depot only rinsed, which was 46.15%, all the drinking water produced contained coliform bacteria. The rest of the depots who do not brushing and rinsing the container of the buyer are found to have total bactericoliform content[18].

Risk management is often used in the fields of financial investment, military planning and public health. In the field of public health, risk management is a policy making and risk control application that can endanger health (EPA, 2012). Microbial Risk Management (MRM) aims to control risk factors that are transmitted by pathogenic microbes that can cause health problems due to consuming water from polluted water sources. Therefore, policy making in microbial risk management is the responsibility of the government and NGOs working in the health sector and related communities so that the transmission of disease through microbes can be prevented or controlled.

One of the principles of Microbial Risk Management (MRM) is that risk management analysis and risk control strategies must be based on the level of risk (risk characterization). Risk characterization is a starting point for formulating risk management and providing a basis for decision making. In addition, risk management must also be based on a risk assessment[10].

According to the WHO Drinking Water Guidelines (2008), it suggests that the risk reference standard level is 10-6. So, if the value of Pinf.d / Pill> 10-6 (for example 10-5) then it is stated with high risk whereas if the value of Pinf.d / Pill <10-6 (for example 10-7) then the risk is declared low. As for the value of Pinf.d / Pill = 10-6, then it is assumed to be of moderate risk.

In the Microbial Risk Assessment Guideline the steps described to make microbial risk management are: formulating problems in a broad context (planning and scoping), risk assessment, determining risk priority choices (risk characterization), making decisions that are appropriately, take action to implement decisions and conduct evaluations related to the effectiveness of the actions taken[19].

Aspects of concern in risk management to overcome the occurrence of diseases, namely: Reducing the risk of disease caused by pathogenic germs by means that employees can pay attention to hygiene and sanitation starting from the processing, filling to sales in accordance with established regulations[5]

Conclution

Based on a Quantitative Risk Assessment, it was concluded that of the 6 DAMIU samples having a high concentration of risk level, for the estimated amount of E. Coli bacteria in Refill Drinking Water in the area around the Pattingaloang Health Center in Makassar City.

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Ethical Clearance: Taken from by the Ethics Committee of University Moslem Indonesia

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